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(54) Title: FACSIMILE INTERNET TRANSMISSION SYSTEM

(57) Abstract

A facsimile Internet transmission system which enables devices such as facsimile machines (10 and 18), which ordinarily can not communicate over the Internet (14) because of the lack of the requisite communication protocols, to transmit and receive data via the Internet (14) and consequently avoids long distance switched telephone network changes. Essentially, the apparatus consists of at least two FaxEngines (12 and 16). A FaxEngine is a device which publicly or privately switches telephone network and provides the ability to encapsulate facsimile data into Internet packets using an appropriate Internet communication protocol, or translates Internet packets into a facsimile data.

FACSIMILE INTERNET TRANSMISSION SYSTEM

BACKGROUND OF THE INVENTION

1.   Field of the Invention

5   This invention pertains generally to communication between devices which are not typically Internet-ready because they lack the required Internet communication protocols.   More specifically, this invention enables communication between fax machines over the Internet as

10   opposed to using conventional long-distance switched telephone network lines.

2.   State of the Art

         Communication is becoming increasingly important as

15   the global economy places more and more emphasis on information.   Businesses in particular must be able to rapidly and reliably transmit and receive information. As we manage more information, our need for rapid information transmission has likewise increased.   For

20   example, we need only look at the history of telecommunications with the telegraph, the telephone and telex machines, each providing a different manner of information transmission which built upon the previous method.   The telex in particular provided a greatly

25   needed method for the transmission of written information. The modern breakthrough which improved the telex was the facsimile (Fax) machine.   Facsimile capabilities are no longer even an option for most large and even many small businesses as use of fax machines is

30   now generally ubiquitous throughout the business world.

         The need for rapid and reliable communication, however, is not limited only to the commercial world. The military has always recognized the importance of maintaining communication lines open in all

35   circumstances. The interest of the government was so keen that it launched the DARPA project.   DARPA

consisted of a computer network which did not rely on any single node for its existence. On the contrary, it was specifically designed to provide multiple pathways for communication to flow from a source to a

5   destination. The successor to the DARPA project is now the better known and widely used Internet. The most widely recognized communication product of the Internet is referred to generically as electronic mail (email). Email, like a facsimile transmission, also communicates

10   by the written word, but without a hard or paper copy being needed at the source of transmission or the destination. Instead, the message arrives encoded in a type of binary format in computer memory for retrieval and display on a computer monitor.

15   A comparison of data transmission by facsimile and by email reveals several important differences other than the paper versus the paperless distinction described above. Most importantly, a facsimile transmission is traditionally accomplished via the

20   switched public telephone networks. Therefore, a long distance facsimile transmission costs the same as a long distance voice telephone call. At today's facsimile transmission and reception speeds, the cost can be prohibitive when the source and destination are far

25   apart or on different continents.

         In contrast, email transmitted over the Internet provides a very different cost structure associated with it. Typically, a user accesses a local provider to the Internet by dialing to a site with a dedicated Internet

30   connection. There is usually a monthly flat fee for unlimited access through the provider. Consequently, there are typically no long distance telephone charges involved in sending or receiving email.

         Several methods have been proposed or implemented

35   for overcoming the drawbacks of slow facsimile

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transmission speeds and high long distance telephone costs. These efforts have focused on compression of facsimiles to shorten transmission time, grouping and delaying facsimile transmissions until telephone rates

5   are lower than at peak hours, using facsimile servers that provide store-and-forward facsimile capability, automatic facsimile send-retry in case of destination busy signals, automatic broadcasting of a facsimile to a list of recipients, and several other methods which

10 all focus on using the existing public switching telephone system.

For example, U.S. Patent No. 5,410,416 by Amberg et al. apparently teaches that multiple low-speed facsimiles can be bundled together into a single

15 facsimile for transmission to a common distribution point, and then the single facsimile is transmitted as a high-speed facsimile to the distribution point where it is unbundled and dispersed as multiple low-speed facsimiles.

20   Similarly, U.S. Patent Nos. 5,287,199 by Zoccolillo, 5,404,231 by Bloomfield, and 5,459,584 by Gordon et al. apparently teach varying methods of distributing, routing and otherwise increasing facsimile throughput on a publicly switched telephone network.

25   One of the main problems with these patents is that while they attempt to decrease facsimile transmission time for groups of facsimiles, their methods do nothing to decrease the costs of sending a single facsimile a long distance. For example, many of the patents address

30 the issue of sending the same facsimile to multiple sites. However, if a business deals in a high volume of unique facsimile transmissions, as most businesses do, then storing and forwarding to a distribution point becomes pointless if this is the only improvement

35 offered. Furthermore, all long distance facsimile

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transmissions, regardless of whether they are sent during off-peak hours or are bundled together, must be sent over a public or private switched telephone network and will thus incur long distance telephone charges.

5   Therefore, it would be an advantage over the state of the art to be able to combine the advantages of inexpensive and rapid long distance communication over the Internet with the ability to send written information by facsimile without incurring long distance

10   telephone charges. This requires that devices which do not ordinarily have the ability to transmit data over the Internet be provided with the capability of transmitting data using Internet communication protocols. Essentially, it would be an advantage over

15   the state of the art to enable any non-Transport Connect Protocol/Internet Protocol (non-TCP/IP) device to communicate over the Internet. It would also be an advantage to be able to send facsimile transmissions over the Internet to a plurality of different

20   destinations simultaneously, thus freeing up a business's local telephone line for other purposes. It would also be an advantage to be able to transmit a facsimile to a remote destination which does not have local Internet access over a switched telephone network

25   at a reduced rate below the normal long distance telephone rate that a facsimile would require. It would be a further advantage to provide subscribers a local access number to which clients could send a facsimile where a virtual facsimile device would then transmit a

30   facsimile to a remotely located home office. It would be a distinct advantage to be able to cross the boundary between message formats and send a facsimile to an electronic mail address on the Internet. Likewise, it would be an advantage to be able to receive a facsimile

35   from an Internet email message utilizing the Internet

for transmitting the long distance portion of the
message, and a switched telephone network for the local
transmission. Finally, it would be a great advantage to
be able to provide the ability to redirect or forward a
facsimile to any fax machine, facsimile modem or even to
an email address while still avoiding long distance
telephone charges.

OBJECTS AND SUMMARY OF THE INVENTION

It is an object of the present invention to provide
a method and apparatus for transmitting a facsimile
between devices over the Internet even though the
devices are not equipped to encapsulate the facsimile
within Internet packets using the appropriate Internet
communication protocols.

It is another object of the invention to provide a
method and apparatus to enable devices which lack
Internet communication protocols to transmit data over
the Internet which would otherwise travel long distance
on a switched telephone network.

It is still another object of the present invention
to provide a plurality of devices having dedicated
Internet connections which are also coupled to a
switched telephone network and act as a translation
conduit for data transmitted between the Internet and
the switched telephone network.

It is yet another object of the present invention
to provide a method and apparatus for enabling the
delivery of a single facsimile over the Internet to a
switched telephone network and then to a plurality of
local receiving fax machines.

A further object of the present invention is to
provide a method and apparatus for translating a
facsimile into an email message format for delivery to
an electronic mail address on the Internet.

Yet another object of the present invention is to provide a method and apparatus for translating an email message originally transmitted via the Internet to a facsimile format for delivery to a fax machine on a

5   switched telephone network.

Still a further object of the invention is to provide a method and apparatus for redirecting incoming facsimiles to an alternative fax machine, facsimile modem or Internet email address.

10   Another object of the present invention is to provide a method and apparatus for providing a local switched telephone network number which provides access to an Internet device capable of redirecting facsimiles received at that location to a receiving fax machine

15   located a long distance telephone call away from the local number via the Internet.

Still yet another object is to provide a method for encryption of a facsimile transmitted over the Internet such that the facsimile is at least as secure as one

20   transmitted over a switched telephone network.

These and other objects of the present invention are provided in a facsimile Internet transmission system which enables fax machines to transmit and receive data over the Internet and consequently avoid long distance

25   publicly or privately switched telephone network charges. This ability would enable a device which ordinarily cannot communicate over the Internet because it lacks the requisite communication protocols to bridge the gap between Internet and switched telephone network

30   communications. Essentially, the apparatus consists of at least two FaxEngines to act as translator and Internet conduit. A FaxEngine is a device which is coupled simultaneously to the Internet and to a publicly or privately switched telephone network and provides the

35   ability to encapsulate a facsimile into Internet packets

using an appropriate Internet communication protocol, or do the reverse and decode Internet packets back into the original facsimile. In typical operation, the method consists of a subscriber a) dialing a local FaxEngine

5   number on a publicly or privately switched telephone network, b) entering the destination facsimile number or numbers, and c) pressing the start key to begin facsimile transfer. The FaxEngine a) receives the facsimile, b) encapsulates it into Internet packets

10   using an Internet communication protocol such as TCP/IP, c) encrypts the message, d) transmits the message over the Internet to a second FaxEngine which is preferably only a local publicly or privately switched telephone network call from the receiving fax machine, e) the

15   second FaxEngine extracts the receiving fax machine telephone number from the message, f) the receiving fax machine is then called by the second FaxEngine via the switched telephone network, and if the receiving fax machine answers, g) the second FaxEngine decrypts the

20   facsimile, h) translates the message into a facsimile format, and i) the message is transmitted to the receiving fax machine.

One advantage to the method and apparatus of the preferred embodiment described above is that the connect

25   time to a FaxEngine is reduced if the same facsimile is intended for delivery to a plurality of fax machines. The invention requires transmission of the facsimile only once to the FaxEngine. The FaxEngine stores the facsimile until it has been successfully transmitted to

30   all intended fax machines. This not only eliminates long distance phone charges, but it also enables the sender to make other use of a telephone line after sending the facsimile to the FaxEngine instead of tying up a line by repeatedly sending the same facsimile to

35   each of the multiple facsimile recipients.

Another advantage of the invention is that if a FaxEngine is not a local telephone call from the sending or receiving fax machine, the system still enables transmission of facsimiles at a reduced rate as opposed

5   to normal long distance telephone rates which the sender would be billed. This is accomplished by taking advantage of high volume long distance telephone contracts. This enables the present invention to always make long distance facsimile transmission less expensive

10   than a conventional long distance direct dialed call.

By providing facsimile to Internet email translation, the present invention also bridges an important communication gap between the expanding number of users on the Internet and the large majority of

15   people and businesses which still rely on facsimiles. This translation ability also enables redirection and forwarding of facsimiles which are typically not capable of being rerouted in the same way that voice messages can be routed. By translating facsimiles into an email

20   format, a receiver can more easily access facsimile transmissions from remote locations that would otherwise have to wait until the receiver returned to the original facsimile destination.

As a convenience to clients, a business using the

25   FaxEngine can also set up a virtual fax machine at a site where many clients are located. To send a facsimile to the business, a client need only dial the local fax machine number which is instead a local FaxEngine access number. The facsimile is received and

30   then sent to the business home office located what is normally a long distance telephone call away. The client thus avoids long distance telephone charges because the business can be communicated with by facsimile as if it was local to the client.

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In its broadest application, the present invention advantageously enables transmission of data between devices which are not considered Internet capable by providing an Internet translation medium and a plurality

5   of Internet access sites such that the majority of telephone calls are local. Even when the Internet cannot be utilized to send the message entirely at a local telephone rate, the present invention is still more cost effective by taking advantage of high volume

10   long distance telephone contracts.

These and other objects, features, advantages and alternative aspects of the present invention will become apparent to those skilled in the art from a consideration of the following detailed description

15   taken in combination with the accompanying drawings.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a block diagram illustrating the main components of the present invention which enables

20   transmission of a facsimile via the Internet.

FIG. 2 is a flowchart of the steps followed by the subscriber when sending a facsimile transmission via the Internet.

FIG. 3 is a breakdown in block diagram form of the

25   main hardware components of a FaxEngine built in accordance with the parameters of the present invention.

FIG. 4 is a flowchart illustrating the operating process of the FaxEngine.

FIG. 5 is a flowchart of the decision process

30   followed by a FaxPort portion of a FaxEngine when receiving a facsimile transmission via a switched telephone network.

FIG. 6 is a flowchart of the decision process followed by a FaxPort portion of a FaxEngine when

sending a facsimile transmission via a switched telephone network.

FIG. 7 is a flowchart of the decision process followed by an I/O Engine Receive portion of a FaxEngine when receiving a facsimile transmission from the Internet.

FIG. 8 is a flowchart of the decision process followed by an I/O Engine Send portion of a FaxEngine when transmitting a facsimile to the Internet.

FIG. 9 illustrates the block diagram components of the present invention required to implement the FaxCC function whereby the same facsimile is transmitted to a selectable number of different fax machines.

FIG. 10 illustrates the block diagram components required to implement Long Distance Delivery of facsimile transmissions.

FIG. 11 illustrates the block diagram components required to implement FaxMail, or the ability to redirect and forward a facsimile to another facsimile, facsimile modem or email address.

FIG. 12 illustrates the block diagram components required to implement Virtual Fax machine, or the ability to dial a local number as if it were a receiving fax machine, and have the facsimile sent long distance via the Internet to the actual receiving fax machine.

FIG. 13 illustrates the block diagram components required to implement FaxBroadcast to multiple receiving fax machines without the copy limitations of FaxCC.

FIG. 14 illustrates the block diagram components required to implement Facsimile to Email Gateway.

FIG. 15 illustrates the block diagram components required to implement Email to Facsimile Gateway.

DETAILED DESCRIPTION OF THE INVENTION

Reference will now be made to the drawings in which the various elements of the present invention will be given numerical designations and in which the invention will be discussed so as to enable one skilled in the art to make and use the invention.

The present invention enables a subscriber to avoid long distance telephone charges which are normally incurred when sending a facsimile (fax) transmission over long distances on a switched telephone network. Presently, a large part of business is conducted by facsimile over conventional switched telephone networks. For example, a user dials the receiving fax machine. If the number is not busy, the user transmits the facsimile to the receiving fax machine. Typically, many fax machines read printed documents and transmit the information as facsimile formatted data across telephone lines. A modified facsimile system can now take advantage of facsimile boards or modems which enable a subscriber to transmit a document saved electronically on a computer as a facsimile without having to first print the document, thereby saving paper. Despite the convenience of the facsimile boards and modems, the sender must still call the receiving fax machine over a switched telephone network, and thus incur long distance phone charges.

FIG. 1 shows how the present invention provides a different price structure and avoids costly long distance phone charges by taking advantage of the local access provided to most users of the Internet. A facsimile transmission is now possible by using an originating fax machine 10 to call a preferably and advantageously local originating FaxEngine 12 which will send the facsimile via the Internet 14 to a receiving

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FaxEngine 16 which is preferably but not necessarily local to the receiving fax machine 18. The receiving FaxEngine 16 ideally makes a local call to the receiving fax machine 18 to complete the facsimile transmission.

5   A more detailed description of the facsimile dialing process by the subscriber is illustrated in FIG. 2 which shows the steps to be followed by the subscriber. As can be seen, the process is only slightly more involved than the existing facsimile

10   transmission process in use today. FaxEngines are accessed by dialing a preferably local FaxEngine access number which provides switched telephone network access to a FaxEngine, as shown in step 20. Step 22 is necessary for determining if the subscriber is calling

15   from a preprogrammed and authorized subscriber. If the subscriber is calling from a preprogrammed number, the subscriber only has to enter the receiving fax machine telephone number as in step 24. For increased security, the process of the present invention requires password

20   verification if the dialing number is not one which the FaxEngine recognizes, as shown in step 26. After password verification, the subscriber continues to step 24. The process advantageously enables a subscriber to select the option of sending the same facsimile

25   transmission to other fax machines in step 28. If desired, the subscriber simply continues to enter additional facsimile destination numbers into the originating fax machine in step 30. This process of adding destination fax machine numbers continues until

30   all desired numbers are entered. The process is completed when the subscriber presses the SEND or START button on the originating fax machine 10 in step 32.

The entire process above is precisely the same process used in transmitting an ordinary facsimile using

35   conventional methods, with two important distinctions.

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First, no password verification is required when dialing from a location other than a preprogrammed number. This step is important, however, because of the second distinction. Specifically, at least two numbers have been entered into the fax machine. The first number is preferably a local FaxEngine access number. The second number is the destination fax machine. Therefore, regardless of where the facsimile will go in the world, the present invention advantageously avoids most long distance telephone charges through the apparatus illustrated in FIG. 1 whereby a call to a local Internet provider provides an Internet access path for the facsimile.

FIG. 3 is a breakdown in block diagram form of the main hardware components of a FaxEngine 40 built in accordance with the objects of the present invention. The FaxEngine 40 is the originating FaxEngine 12 as well as the receiving FaxEngine 16 shown in FIG. 1.

A box 42 is shown drawn around components of the FaxEngine 40 to illustrate divisions in function. The FaxEngine itself is a dedicated interrupt driven computer system. In a preferred embodiment, the computer is an Intel-based Complex Instruction Set Computer (CISC) computer system. However, this does not mean that a Reduced Instruction Set Computer (RISC) based system could not be used.

The computer system is controlled by an Operating System (OS), and has been implemented in this invention under Windows NT Version 3.5 (44). Again, this does not eliminate the use of other OSes such as UNIX or any of its variant forms. What is important to the present invention is that the OS have the capability of providing a multitasking operating environment.

The software which implements the method of the present invention is not to be considered in and of

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itself as using code structure which is the subject of this patent. Rather, it is the specific functions implemented by the software which are important and are claimed hereinafter. The FaxEngine 40 may be
5   functionally considered as being comprised of a plurality of FaxPorts 46, a Facsimile queue 48, and an Input/Output (I/O) Engine 50. The FaxPorts 46 provide the FaxEngine 40 with communication access to switched telephone network lines 52 for both transmitting and
10   receiving facsimiles. The I/O Engine 50 provides the FaxEngine 40 with Internet access for transmitting and receiving facsimiles which are encapsulated as Internet packets for Internet 14 travel. It should also be mentioned that the Facsimile queue 48 can be eliminated
15   from the FaxEngine 40 entirely by transmitting the facsimile immediately, but has been implemented here in a preferred embodiment.

          The FaxPorts 46 have a dual function as mentioned above. They both send and receive facsimiles via a
20   switched telephone network. Communication to a FaxPort from the telephone lines 52 occurs on a thread 56, each thread 56 being capable of both sending and receiving. Each FaxPort 46 is also physically coupled to one Fax Board 54 by way of this FaxPort thread 56. A typical
25   implementation would use the Brooktrout Fax Board. A Fax Board 54 provides a connection of up to 8 switched telephone network lines 52, with the computer system typically supporting, at present, up to 6 FaxPorts 46 for a total access to forty eight switched telephone
30   network lines 52 by the FaxEngine 40.

          The FaxEngine 40 is controlled by a Main FaxEngine Process 38 as shown in FIG. 4. This process 38 enables the FaxEngine 40 to act as a central processor for the control and management of the FaxEngine 40 and the
35   requisite sub-processes to be described. Upon startup,

the Main FaxEngine Process 38 initializes all of the hardware as required and is shown as step 70. Step 72 involves activation of the FaxPorts 46, the FaxPort threads 56, the I/O Engine 50 and the I/O Engine thread 58. These threads 56, 58 manage all Facsimile Boards 54 and Internet interface connections 60.

The Main FaxEngine Process 38 remains in a loop waiting for event notification 76. After receiving a notification from any of the processes it has started, a signal 78 is sent to initiate a check of the notification signal. First, the computer system verifies in step 80 that the notification is valid and not a hardware induced error. This verification 80 can be done in many ways and is not the subject of this patent. If there is no error, the process 38 goes back into a loop to wait for another event notification 76.

For example, an event notification alarm might be a system alert indicating that diagnostic software is to be executed. The next step 82 is to test and diagnose hardware. Step 82 could either be accomplished automatically by the system with automatic diagnostic software, or a message or other indicator could alert a computer system administrator that the system needed servicing. If the diagnostic step 82 is automatic, the failed hardware is disabled by the computer system so as not to interfere with the computer system operation.

As FIG. 4 indicates, step 72 activates FaxPort and I/O Engine subprocesses. The FaxPort 46 process is actually two separate processes, sending 99 and receiving 98. The Sending Process 99 is defined as the steps which occur in the receiving FaxEngine 16 when it has received an encrypted facsimile via the Internet 14, and what must occur to send it to a receiving fax machine 18. The Receiving Process 98 is defined as the

steps which occur in the originating FaxEngine 12 when
it receives a facsimile from an originating fax machine
10 and must transmit it via the Internet 14 to the
receiving FaxEngine 16.

5   The first process to be described is the Facsimile
Receiving Process 98. Facsimiles are sent and received
via the switched telephone network 52 as shown in FIG.
3. FIG 5 illustrates as a flow chart the process 98 to
be described. The first step 100 comprises resetting

10   the phone lines 52 and configuring the Fax Board 54
hardware as necessary. The FaxPort thread 56 then waits
in a loop for one of two events. The first event 98 is
an incoming call arriving from the switched telephone
network lines 52. The second event is a notification

15   that a facsimile needs to be sent 99.

        In the FaxPort Receive Process 98, the FaxPort
thread 56 enters a continuous loop 102 by waiting for
notification from hardware that a call has been
received.   This loop continues, in a preferred

20   embodiment, for about 20 seconds. After 20 seconds, the
loop times out and the process 98 determines in step 104
whether a call has bee received. If no call has been
received, the process 98 determines whether there are
any outgoing facsimiles to send in step 106. If there

25   are waiting facsimiles, the process goes to the FaxPort
Send Process 99 to be discussed in FIG. 6.

        If an incoming call is detected in step 104, the
FaxPort thread 56 authenticates the subscriber to the
network.   Authentication 108 involves retrieving the

30   originating fax machine number from the Fax Board 54
using   Automatic   Number   Identification   (ANI).
Alternatively, authentication can be accomplished by
attachment of a device to the telephone line of the
originating fax machine 10 which transmits the number

35   automatically. If the originating fax machine 10 is

calling from a known number 110 (one that has been preconfigured), then the subscriber of the originating fax machine 10 is prompted to provide the phone number of the destination fax machine 18 in step 112. The

5   subscriber is then able to select additional facsimile destination machines 18 in step 114 if the same facsimile will be sent more than once.

Before proceeding further, assume that the originating fax machines' number is not known because it

10 was not preconfigured in Facsimile Engine 12 memory. In this case, an automated greeting is started in step 116 which requests the originating fax machine 10 to input a password, in a preferred embodiment, via a touch tone telephone or alternately by a DTMF signal. If the

15 password is verified as correct in step 118, the subscriber is allowed to proceed to step 112 where fax machine recipients are selected. If, however, the password is invalid, the system determines how many attempts have been made in step 120 to input a correct

20 password. If some predetermined attempt limit is exceeded, the subscriber is informed by a prerecorded message that the password attempt limit is exceeded in step 122. The system then hangs up the line and is reset for use in step 124. If the limit was not

25 exceeded in step 120, a prerecorded message informs the subscriber that the password was incorrect and the subscriber is prompted to re-enter the password again in step 116.

Once all receiving facsimile numbers are entered in

30 step 114, the subscriber of the originating fax machine 10 presses START or SEND. At this point, the FaxEngine 12 is directed to negotiate communication parameters such as transmission speed with the originating fax machine 10 in step 126. If the correct features are

35 negotiated in step 128, the FaxPort thread 56 receives

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the facsimile into memory or a buffer in step 130. If
no errors were detected by the FaxEngine 12 in step 132,
the facsimile is encrypted in step 134, for example,
using the RSA encryption algorithm by RSA Data Security,

5   Inc. The encrypted facsimile is then sent to a queue in
step 136, it is logged to accounting in step 138, and
the line hangs up and is reset in step 140.

Two important observations are that first, whenever
correct features are not negotiated in step 128 or there

10   are hardware errors, the failures or errors are noted
and logged to accounting in step 138, the line hangs up
and is reset. The second observation is that when the
encrypted facsimile is queued in step 136, the facsimile
is then sent to the I/O Engine for transmission over the

15   Internet after encapsulation as Internet packets.

In FIG. 5, step 106, a determination was made by
the FaxPort receive process 98 of whether any facsimiles
were waiting to be transmitted to a receiving fax
machine 18.   This occurs because the originating

20   FaxEngine 12 can simultaneously and advantageously
function as a receiving FaxEngine 16. If facsimiles are
waiting, the FaxPort send process 99 proceeds as shown
in FIG. 6.

The first step 170 of FIG. 6 is shown to be a

25   loading and locking of the facsimile to be sent from the
receiving FaxEngine 16 to the receiving Fax machine 18.
The facsimile is loaded in its encrypted format in a
memory buffer until actually transmitted.   Step 172
shows that the FaxPort process 99 instructs the

30   FaxEngine 16 to open a switched telephone line 52. For
clarity, refer back to FIG. 3 which shows that a FaxPort
46 with an associated FaxPort thread 56 opens one of
eight telephone lines 52 controlled by a single Fax
Board 54. If no incoming call is detected on the opened

35   telephone line in step 174, the FaxPort process 99

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instructs the FaxEngine 16 to dial, via the switched telephone network, the number of the receiving fax machine 18.

It should be obvious that in order to dial the telephone number of the receiving fax machine 18, that information cannot be part of the encrypted facsimile waiting in FaxEngine 16 memory. This is not a problem because the receiving facsimile number is generally not confidential in nature. It is the contents of the facsimile which should be and are protected.

After dialing the receiving fax machine 18, the FaxEngine 16 determines if the receiving fax machine 18 answered the line in step 178. If there is no answer or if the line was answered but it was not the receiving fax machine 18, a failure is logged in step 180. Furthermore, the lock on the facsimile is released in step 182, and the FaxPort 46 determines if there have been too many failed attempts (exceeded a predetermined limit) to reach the receiving fax machine 18 in step 184. If the failure limit is not exceeded, the line is hung up and reset in step 186. However, if the failure limit is exceeded, the FaxPort 46 generates a facsimile to the sender of the facsimile in step 188; the facsimile explaining why the failure occurred.

If it is determined that the receiving fax machine 18 did answer the telephone line in step 178, the Fax Board 54 negotiates communication parameters with the receiving fax machine 18 in step 190.

If the FaxEngine 16 and receiving fax machine 18 do not negotiate successfully as determined in step 192, the failure is logged and the FaxPort 46 executes steps step 180 to 186. If the negotiation is successful, the facsimile is now decrypted. The reason for waiting to decrypt the facsimile until the receiving fax machine 18 is ready to receive is very practical. For example, if

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the receiving fax machine 18 cannot be reached, the
facsimile will obviously not be sent. However, if the
facsimile was already decrypted earlier, the time and
resources of the FaxEngine 16 have been wasted.

5   Furthermore, if the message is decrypted, the facsimile
loses protection against prying electronic fingers, and
facsimile security is needlessly placed in jeopardy.

After decryption, the facsimile is delivered to the
Fax Board 54 for transmission to the receiving fax

10   machine 18 in step 196. After transmission of the
facsimile, the FaxEngine 16 queries the Fax Board 54 in
step 198 to determine if delivery of the facsimile was
successful. A failure produces another error log entry
in steps 180 through 186. However, if successful, a log

15   entry is entered in step 200 and the line is hung up and
reset in step 202.

Thus far, the discussion has explained the process
of communication between the fax machines 10, 18 and the
FaxEngines 12, 16 via the switched telephone network.

20   Still to be addressed is the process of communication
between the originating and receiving FaxEngines 12, 16
via the Internet 14.

FIG. 7 illustrates the I/O Engine process 206
executed by the receiving I/O Engine 50. In step 210,

25   the receiving I/O Engine 50 waits for incoming data from
the Internet 14. When detection of incoming data occurs
(notification of incoming Internet packet traffic), the
I/O Engine 50 starts a receiving I/O Engine thread 58 as
shown in FIG. 3 and illustrated by step 212. To

30   initiate the transfer of data from the originating
FaxEngine 12, there must also be an authentication
process with the peer (originating FaxEngine 12) as
shown in step 214. Essentially, the authentication
process verifies that the facsimile is being transferred

35   to the intended recipient.

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After authentication, the data comprising the
facsimile is transferred as shown by step 216. At this
point, step 218 shows that the facsimile is queued in
anticipation of initiation of the FaxPort send process

5   99 which will transmit the facsimile to the receiving
fax machine 18. The queue process is essentially
storage of the facsimile in volatile memory or on a hard
disk until it is ready to be sent to a receiving fax
machine 18. The I/O Engine thread 58 is also released

10   so that other incoming facsimiles may be received.

The I/O Engine send process 204 as illustrated in
FIG. 8 has more activities to control than the receiving
process 206 of FIG. 7. First, the originating FaxEngine
12 receives the facsimile from the originating fax

15   machine 10, the process being controlled by the FaxPort
receive process 98. After an event notification is
generated from the FaxPort receive process 98 that a
facsimile is being received, the I/O Engine send process
204 initiates an I/O Engine thread 58 in step 230. The

20   process 204 then waits for the facsimile to arrive at
the incoming facsimile queue in step 232. When the
facsimile arrives, step 234 indicates that the recipient
list is loaded based upon the information received from
the originating fax machine 10. Selection of one or

25   more receiving FaxEngines 16 in step 236 is based upon
the switched telephone network area code and the first
three digits of the seven digit telephone number.

If a receiving FaxEngine 16 is not remote relative
to the originating FaxEngine 12 as determined in step

30   237, the facsimile transmission process is simplified by
proceeding directly to step 238 which loads the local
facsimile into the outgoing facsimile queue where the
FaxPort send process 99 of FIG. 6 contacts the receiving
fax machine 18.

22

However, if the receiving fax machine 18 is remote, the facsimile must travel over the Internet 14. Step 240 shows that the FaxEngines 12, 16 must authenticate as described previously, the facsimile is encapsulated

5   into Internet packets using an appropriate Internet protocol such as TCP/IP in step 242, and the facsimile is transmitted in step 244.

Step 246 indicates that the process of steps 236 through 248 must be repeated for each receiving fax

10   machine 18 whose telephone number was entered by a subscriber on the originating fax machine 10, where step 248 consists of the telephone number of the next receiving fax machine 18 being loaded into memory for determination of whether the recipient is local or

15   remote.

If there are no more recipients as determined in step 246, the next step is 250 where a status check is made to determine whether the facsimile transmission to all receiving fax machines 18 was successful. If not,

20   the facsimile is queued for transmission in step 252 in the outgoing facsimile queue. However, if successful, the facsimile is removed from memory in step 254, and the process 204 is complete for that particular facsimile.

25   An important feature of the present invention is the two-step process for handling errors or failures in transmissions. These events trigger an accounting log to record the event, and more importantly, provide feedback to an operator such as the sender of the

30   facsimile that the process has failed. Notification is typically done by facsimile to the appropriate party. Ideally, the accounting log is able to indicate where the failure occurred in the process. If the failure is local or remote, it might be repaired through self

35   diagnostic procedures of the FaxEngine 12 or 16. If the

23

failure is at a fax machine 10 or 18, repair to the originating fax machine 10 or a call to the receiving fax machine 18 owner might solve the problem. The key issue is that the subscriber is not left wondering where

5   the process has failed so that appropriate repair procedures might be implemented.

Another feature which bears greater explanation are the FaxEngine components. As explained previously, the FaxEngine is shown in FIG. 3 as being controlled by a

10   Main FaxEngine Process 38 which oversees operation of the hardware described as the FaxPorts 46, the Facsimile queue 48 and the I/O Engine 50. It is important to observe again that it is not essential to implement a Facsimile queue 48 in the FaxEngine 40. Alternative

15   embodiments allow for immediate transmission of the facsimile instead of implementing a queue structure. The facsimiles might also be stored on a hard disk in random order. The facsimiles are logged with a time/date stamp in order to process facsimiles in the

20   order received. This change may be implemented without having to change the Main FaxEngine Process 38 itself.

While the detailed description above has focused on the main feature of the present invention of facsimile transmission via the Internet, there are several other

25   services which the present invention makes both feasible and desirable. These additional services are called FaxCC, Long Distance Delivery, FaxMail, Virtual FaxMachine, Facsimile Broadcast, Email to Facsimile Gateway, and Facsimile to Email Gateway.

30   The FaxCC service is illustrated in FIG. 9, and provides the ability to transmit the same facsimile to multiple destination sites (up to five) without having to dial each individual receiving fax machine 18. Instead, the facsimile is transmitted only one time to

35   the originating FaxEngine 12. The FaxEngine 12 is

tasked with distributing the facsimile to the multiple
destinations as entered by the subscriber from the
originating fax machine 10. The Figure is illustrated
as shown to indicate that there may be more than one
5   receiving FaxEngine 16 in order to reach up to five
different receiving fax machines 18.

The functionality of the FaxCC service differs from
the prior art in significant aspects. Most importantly,
long distance telephone charges are avoided entirely if
10   the receiving fax machines 18 are a local telephone call
from any FaxEngine 16 site when the facsimile is
transferred via the Internet and then by switched
telephone network. Furthermore, there are advantageous
accounting and error logging and sender informing
15   services to assist the sender.

The Long Distance Delivery service illustrated in
FIG. 10 is for those receiving fax machines 18 which are
located further than a local switched telephone network
call away from all FaxEngines 16. While this
20   circumstance will ideally be rare, it is certainly
possible. Therefore, the present invention will
compensate by determining the location of the FaxEngine
16 which will be billed the lowest rate for making the
long distance call 260 to the receiving fax machine 18.
25   The long distance telephone charge is further reduced by
contracting with long distance telephone providers to
obtain a lower cost, high volume contract than can be
obtained by single parties. This guarantees to the
sender that the facsimile will be transmitted at a cost
30   that is always less than if the sender were to transmit
the facsimile directly, bypassing the Internet 14.

An optional service which can be provided to
subscribers of the present invention is FaxMail as
illustrated in FIG. 11. FaxMail is analogous to call
35   forwarding, but a facsimile is transmitted to a new

25

location instead of a telephone call. The advantages of
this service are not only that a facsimile can be
forwarded, but the format of the facsimile can be
altered. That is it say, the facsimile can be forwarded
5   to another fax machine, to a facsimile modem, and with
the present invention, to an electronic mail address by
using the Facsimile to Email Gateway feature to be
explained. The ability to receive a facsimile in an
electronic (paperless) format is an especially great
10   advantage to mobile people and businesses because of the
increasing popularity of email over the Internet 14.
The necessary elements of the system are then a
redirected receiving FaxEngine 262 and then either a
redirected receiving fax machine 264 or a redirected
15   receiving email address 266 on the Internet 14.

The Virtual FaxMachine as illustrated in FIG. 12
provides a subscriber with the ability to be
accommodating to clients or other people who either lack
the resources for making expensive or significant
20   numbers of long distance phone calls, or to just provide
another convenience. Specifically, a subscriber
"creates" a virtual fax machine 268 which is a local
telephone call from an originating fax machine 10. The
new fax machine 268 is actually just a local FaxEngine.
25   However, instead of requiring the sender to input a long
distance telephone number for the receiving fax machine
18, the FaxEngine 268 has a system for mapping a
telephone phone called by an originating fax machine 10
to access the FaxEngine 12. The FaxEngine 268 will then
30   have instructions associated with the telephone by which
it was accessed such that it will transmit the facsimile
via the Internet 14 to the subscriber's receiving fax
machine 18. This way, the FaxEngine 268 does not
require pre-programming with every client's originating
35   fax machine telephone number which might call.

26

For example, Business in New York wants to allow a number of small clients in Los Angeles to be able to send it facsimiles by dialing a local Los Angeles telephone number. The local Los Angeles FaxEngine 268 can be called by dialing 555-0123. The FaxEngine 268 maps any calls to the number as being directed to Business's receiving fax machine 18. Thus, when the client's originating fax machine 10 calls the FaxEngine 268, the FaxEngine 268 immediately forwards the facsimile to Business's receiving fax machine 18 in New York. Advantageously, the client only makes a local telephone call, and Business is not charged for the long distance facsimile transmission.

The Facsimile Broadcast illustrated in FIG. 13 is an optional service which allows the subscriber to send a facsimile to many receiving fax machines simultaneously. This is opposed to the FaxCC service which is limited in its scope of multiple deliveries. Furthermore, each of the receiving facsimile machines' telephone numbers does not have to be entered at the originating fax machine 10. Instead, a list of telephone numbers of receiving fax machines 18 is provided to a service which enters the numbers for the subscriber. This greatly simplifies the process of mass faxing.

The last two services to be described herein are the Email to Facsimile Gateway and the Facsimile to Email Gateway functions of the present invention. The services are rather self explanatory in that the present invention bridges the gap between exclusively facsimile and exclusively email technology. As might be surmised, the Facsimile to Email Gateway is the service which allows FaxMail to receive a facsimile and then forward it as email to a remote location for the receiver as shown in FIG. 14.

27

This service is provided by enabling the facsimile sender to indicate an email address as the intended destination of the facsimile. There are several methods to implement this function. For example, the sender can
5   send the facsimile from a facsimile modem such that the paperless facsimile can have encoded in it the email address 270 in an easily readable electronic format. Another method usable with FaxMail is to have the receiving FaxEngine preprogrammed with the email address
10   270 such that any incoming facsimiles are forwarded automatically without the sender having to provide it.

      The Email to Facsimile Gateway illustrated in FIG. 15 is essentially the same process. The originating email message 272 provides the ability to specify the
15   Internet address of a receiving FaxEngine 16. The email message also contains within it the telephone number of the receiving fax machine 18. The FaxEngine 16 simply retrieves the receiving fax machine telephone number and the facsimile is transmitted as described before.

20   It is to be understood that the above-described embodiments are only illustrative of the application of the principles of the present invention. Numerous modifications and alternative arrangements may be devised by those skilled in the art without departing
25   from the spirit and scope of the present invention. The appended claims are intended to cover such modifications and arrangements.

28

CLAIMS

What is claimed is:

1.   A facsimile transmission system for sending a
      facsimile via

5   the Internet, said system comprising:

      at least one originating facsimile means for
transmitting data formatted as a facsimile via a first
switched telephone network;

      at least one originating faxengine means for

10   receiving the facsimile data via the first switched
telephone network, encapsulating the facsimile data
within at least one Internet packet using an Internet
protocol such that the message is suitable for
transmission via the Internet, and transmitting the

15   facsimile via the Internet;

      at least one receiving faxengine means for
receiving the facsimile transmitted by the originating
faxengine means, de-encapsulating the Internet packet
encapsulation process, and transmitting the facsimile

20   via a second switched telephone network; and

      at least one receiving facsimile means for
receiving the facsimile via the second switched
telephone network.

25   2.   The system as defined in claim 1 wherein the at
least one originating facsimile means and the at least
one receiving facsimile means are facsimile machines
designed to transmit and receive facsimiles via a
switched telephone network.

30

      3.   The system as defined in claim 2 wherein the at
least one originating facsimile means and the at least
one receiving facsimile means are facsimile machines
which are incapable of encapsulating a facsimile within

Internet packets suitable for transmission via the Internet in accordance with an Internet protocol.

4.   The system as defined in claim 1 wherein the at least one originating and the at least one receiving facsimile means are located at remote distances from each other such that long distance telephone rates would apply for a direct call between them.

5.   The system as defined in claim 1 wherein the at least one originating faxengine means has at least one faxport coupled by a faxport thread to a fax board which is in turn coupled to the first switched telephone network.

6.   The system as defined in claim 1 wherein the at least one receiving faxengine means has at least one faxport coupled by a faxport thread to a fax board which is coupled to the second switched telephone network.

7.   The system as defined in claim 1 wherein the at least one originating faxengine means has an I/O engine coupled by an I/O Engine thread to an Internet interface which is coupled to the Internet via a dedicated connection.

8.   The system as defined in claim 1 wherein the at least one receiving faxengine means has an I/O engine coupled by an I/O engine thread to an Internet interface which is coupled to the Internet via a dedicated connection.

9.   The system as defined in claim 1 wherein the at least one originating facsimile means and the at least

30

one receiving facsimile means are facsimile boards in a
computer system designed to transmit and receive
paperless facsimiles over a switched telephone network.

5   10.   The system as defined in claim 1 wherein the at
            least one
      originating faxengine means and the at least one
      receiving faxengine means are functionally
      interchangeable.

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      11.   The system as defined in claim 10 wherein there are
            a
      plurality of originating and receiving faxengines
      distributed at various dedicated Internet sites.

15

      12.   The system as defined in claim 1 wherein a
            faxengine means
      can also function as a virtual faxmachine means for
      providing a facsimile destination for a received
20   facsimile at a local switched telephone network number,
      said virtual faxmachine then forwarding the received
      facsimile via the Internet to a remote location, wherein
      said forwarding of the received facsimile would normally
      incur long distance telephone charges.

25

      13.   The system as defined in claim 1 wherein the at
            least one
      originating and the at least one receiving faxengine
      means are comprised of:
30   at least one faxport having at least one faxport
      thread, said at least one faxport thread providing
      access to a faxboard external to the faxengine means;
            an Input/Output (I/O) engine having an I/O engine
      thread, said I/O engine providing access to an Internet
35   interface external to the faxengine means;

31

a facsimile queue for queuing facsimiles to be transmitted to the at least one faxport, to be received from the at least one faxport, to be transmitted to the I/O engine, and to be received from the I/O engine; and

5   a main faxengine process operating in memory which coordinates operation of said faxengine means components.

14. The system as defined in claim 13 wherein said
10   faxengine

means is a computer executing a multitasking operating system.

15. The system as defined in claim 14 wherein said
15   multitasking

operating system is selected from the group of operating systems such as Windows NT, UNIX and variations of UNIX.

16. A system for transmitting information via the
20   Internet using

communication devices which do not transmit information using Internet communication protocols, said system comprising:

at least one originating communication means for
25   transmitting non-Internet encapsulated data via a first switched telephone network;

at least one originating Internet translation engine means for receiving the non-Internet encapsulated data via the switched telephone network, encapsulating
30   said data into Internet packets using an Internet protocol such that said data is suitable for transmission via the Internet, and transmitting the Internet packets via the Internet;

at least one receiving Internet engine means for
35   receiving the Internet packets transmitted by the

originating Internet translation engine means, de-
encapsulating the Internet packet, and transmitting the
non-Internet data via a second switched telephone
network; and

5   at least one receiving communication means for
receiving said data via the second switched telephone
network.

17.   The system as defined in claim 16 wherein the at
10   least one originating communication means and the at
least one receiving communication means are selected
from non-Internet protocol transmission devices designed
to simultaneously transmit and receive data via a
switched telephone network.

15

18.   The system as defined in claim 16 wherein the at
         least one
originating communication means and the at least one
receiving communication means are located at remote
20   distances from each other such that long distance
telephone rates would apply for a direct telephone call
between them.

19.   The system as defined in claim 16 wherein the at
25   least one
originating Internet translation engine means and the at
least one receiving Internet translation engine means
are functionally interchangeable.

30   20.   The system as defined in claim 16 wherein there are
           a
plurality of originating and receiving Internet
translation engines distributed at various dedicated
Internet connection sites.

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21. A method for transmitting facsimiles via the
     Internet, the method comprising the steps of:
     a) providing an originating facsimile transmission
means for transmitting a facsimile via a first switched
5   telephone network;
     b) providing an originating faxengine means for
receiving the facsimile via the first switched telephone
network and transmitting the facsimile via the Internet;
     c) providing a receiving faxengine means for
10   receiving the facsimile via the Internet and
transmitting the facsimile via a second switched
telephone network; and
     d) providing a receiving facsimile means for
receiving the facsimile via the second switched
15   telephone network.

22. The method as defined in claim 21 wherein the step
     of
providing an originating faxengine means for receiving
20   the facsimile via the first switched telephone network
and transmitting the facsimile via the Internet
comprises the more specific step of initiating a main
faxengine process, said process including the steps of:
     a) initializing all faxengine means hardware
25   including faxengine means receive hardware;
     b) activating a faxengine means receive event loop
which provides an event notification signal when a
facsimile is being received;
     c) waiting for the event notification signal;
30   d) verifying that the faxengine means hardware is
not malfunctioning when the event notification signal is
received; and
     e) disabling malfunctioning faxengine means
hardware if verification of the faxengine means hardware
35   fails.

34

23.   The method as defined in claim 22 wherein the step
of activating the faxengine receive loop which provides
an event notification signal indicating a facsimile is
being received from the switched telephone network and
5   is to be transmitted via the Internet includes the
further steps of:

        a) verifying that the facsimile being received is
coming from an authorized faxengine subscriber;

        b) obtaining at least one receiving fax machine
10   telephone number from the originating fax machine;

        c) encrypting the facsimile;

        d) encapsulating the facsimile within at least one
Internet packet such that the facsimile can be
transmitted via the Internet; and

15   e) transmitting the facsimile via the Internet to
a receiving faxengine means.

24.   The method as defined in step 23 wherein the step
        of
20   verifying that the facsimile being received is from an
authorized faxengine subscriber includes the steps of:

        a) obtaining a telephone number of the originating
fax machine;

        b) comparing the telephone number of the
25   originating fax machine to a predefined list of
authorized faxengine subscribers; and

        c) requesting a password from the subscriber if the
telephone number of the originating fax machine is not
on the predefined list, such that faxengine subscribers
30   can use the system from any switched telephone network
location.

25.   The method as defined in claim 24 wherein the step
        of

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obtaining the telephone number of the originating fax machine is determined using automatic number identification (ANI) or DTMF signals.

5   26.   The method as defined in claim 23 wherein the step of

obtaining at least one receiving fax machine telephone number includes the step of prompting a subscriber at the originating fax machine for additional receiving fax

10   machine telephone numbers such that the facsimile may be transmitted to a plurality of different receiving facsimile machines.

27.   The method as defined in claim 23 wherein the step

15   of encrypting the facsimile comprises the more specific step of encrypting the facsimile using an RSA encryption algorithm to protect the confidentiality of the facsimile.

20   28.   The method as defined in claim 23 wherein the step of encapsulating the facsimile within at least one Internet packet such that the facsimile can be transmitted via the Internet includes the step of encapsulating the facsimile within at least one Internet

25   packet which is prepared in accordance with an accepted Internet protocol.

29.   The method as defined in claim 28 wherein the step of

30   encapsulating the facsimile within at least one Internet packet prepared in accordance with an accepted Internet protocol comprises the more specific step of using transport connect protocol/Internet protocol (TCP/IP).

30. The method as defined in claim 23 wherein the step of transmitting the facsimile via the Internet to a receiving faxengine means includes the further step of determining which receiving faxengine means should
5   receive the facsimile by locating a receiving faxengine means which is preferably a local telephone call from the destination fax machine.

31. The method as defined in claim 30 wherein the step
10   of
locating a receiving faxengine means which is preferably a local telephone call from the receiving fax machine comprises the additional step of location a faxengine means which can make the least expensive long distance
15   telephone call to the receiving fax machine if no receiving faxengine means can be located which is within a local telephone call from the receiving fax machine.

32. The method as defined in claim 23 wherein the step
20   of
providing a receiving faxengine means for transmitting the facsimile from the receiving faxengine means to the receiving facsimile means via the second switched telephone network comprises the more specific step of
25   initiating a main faxengine process, said process including the steps of:
        a) initializing all faxengine means hardware including faxengine means transmission hardware;
        b) activating a faxengine send event loop which
30   provides an event notification signal when a facsimile is to be transmitted;
        c) waiting for the event notification signal;
        d) verifying that the faxengine means hardware is not malfunctioning when the event notification signal is
35   received; and

e) disabling malfunctioning faxengine means
hardware if verification of the hardware fails.

33. The method as defined in claim 32 wherein the step
5   of activating the faxengine send event loop which
provides an event notification signal indicating a
facsimile is to be transmitted from the receiving
faxengine means to the receiving facsimile means via the
switched telephone network includes the further steps
10 of:
        a) verifying that the facsimile being received via
the Internet is coming from an authorized faxengine
subscriber;
        b) reassembling the at least one Internet packet
15 into the facsimile;
        c) obtaining at least one receiving fax machine
telephone number from the facsimile;
        d) opening a connection to the receiving fax
machine via the second switched telephone network;
20   e) decrypting the facsimile if the connection to
the receiving fax machine is successful; and
        f) transmitting the facsimile to the receiving
facsimile machine.

25 34. The method as defined in claim 23 wherein the step
of obtaining at least one receiving fax machine
telephone number from the originating fax machine
includes the further step of obtaining a plurality of
receiving fax machine telephone numbers provided by the
30 subscriber at the originating fax machine such that the
facsimile is transmitted to all the receiving facsimile
machines whose telephone numbers are provided by the
subscriber.

35.   The method as defined in claim 23 wherein the step of obtaining at least one receiving fax machine telephone number from the originating fax machine includes the further step of pre-programming the originating faxengine means such that the facsimile is transmitted to a plurality of receiving facsimile machines whose telephone numbers have been previously provided to the originating Faxengine means.

5

36.   The method as defined in claim 21 wherein the steps of providing a receiving faxengine means for receiving the facsimile via the Internet and transmitting the facsimile via a second switched telephone network to a receiving facsimile means via the second switched telephone network includes the further step of redirecting the facsimile from the receiving facsimile means to a new receiving facsimile means when the system is directed to reroute facsimiles temporarily to a new receiving facsimile means.

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37.   The method as defined in claim 21 wherein the steps of providing a receiving faxengine means for receiving the facsimile via the Internet and transmitting the facsimile via a second switched telephone network to a receiving facsimile means via the second switched telephone network includes the further step of redirecting the facsimile from the receiving facsimile means to an electronic mail address accessible via the Internet when the system is directed to reroute facsimiles temporarily to an electronic mail address.

25

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38.   The method as defined in claim 21 wherein the step of providing an originating facsimile transmission means for transmitting a facsimile via a first switched telephone network and providing an originating faxengine

35

means for receiving the facsimile via the first switched telephone network and transmitting the facsimile via the Internet comprises the further step of creating a virtual fax machine such that a subscriber using the

5   originating facsimile transmission means calls a mapped telephone number of the originating faxengine means and the receiving faxengine means automatically transmits all facsimiles transmitted to the mapped telephone number to a predefined receiving facsimile means.

10

39. A method for transmitting a facsimile to an email address
located on the Internet, the method comprising the steps of:

15   a) providing an originating facsimile transmission means for transmitting a facsimile via a first switched telephone network; and

b) providing an originating faxengine means for receiving the facsimile via the first switched telephone

20   network and transmitting the facsimile via the Internet to an Internet email address.

40. A method for transmitting an email message to a receiving facsimile means, the method comprising the

25   steps of:

a) providing an Internet connection such that a subscriber may transmit the email message as at least one Internet packet via the Internet to an Internet address;

30   b) providing a receiving faxengine means at the Internet address, extracting a facsimile from the email message which is received by the receiving faxengine means, and transmitting the facsimile via a first switched telephone network; and

40

c) providing a receiving facsimile means for receiving the facsimile via the first switched telephone network.

5   41. A method for transmitting data from a device which transmits

data via a switched telephone network, but which does not encapsulate data within Internet packets for transmission, said method comprising the steps of:

10   a) providing a originating communication means which typically communicates via a first switched telephone network;

b) providing a transmitting Internet engine means for receiving data from the originating communication

15   means via the first switched telephone network and for transmitting said data via the Internet;

c) providing a receiving Internet engine means for receiving the data from the Internet and for transmitting said data via a second switched telephone

20   network; and

d) providing a receiving communication means which typically communicates via the second switched telephone network, and receiving the data from the receiving Internet engine means.

25

42. The method as defined in step 41 wherein the step of

transmitting the data via the Internet includes the step of encapsulating the data within at least one Internet

30   packet in accordance with an Internet protocol such that the facsimile can be transmitted via the Internet.
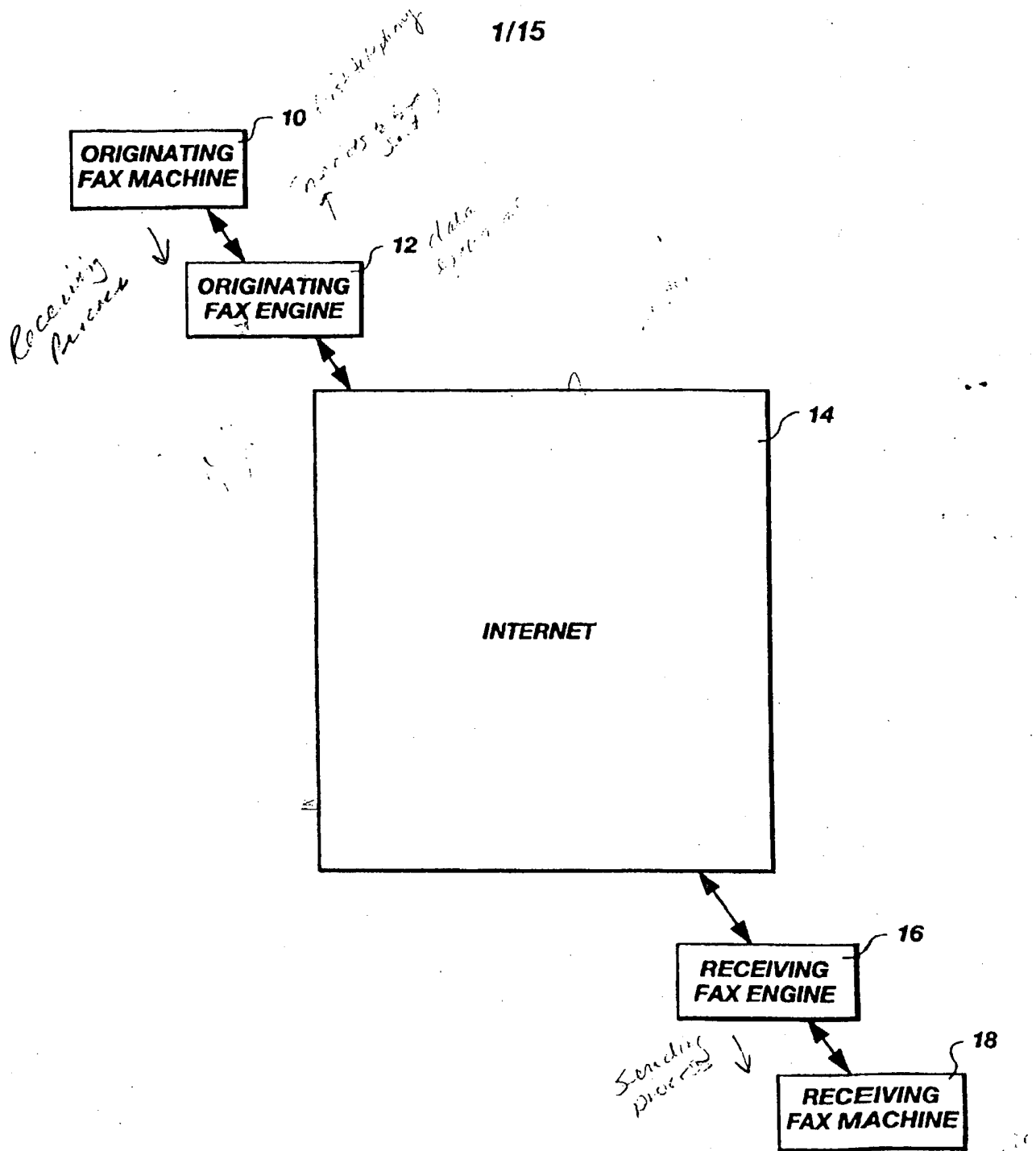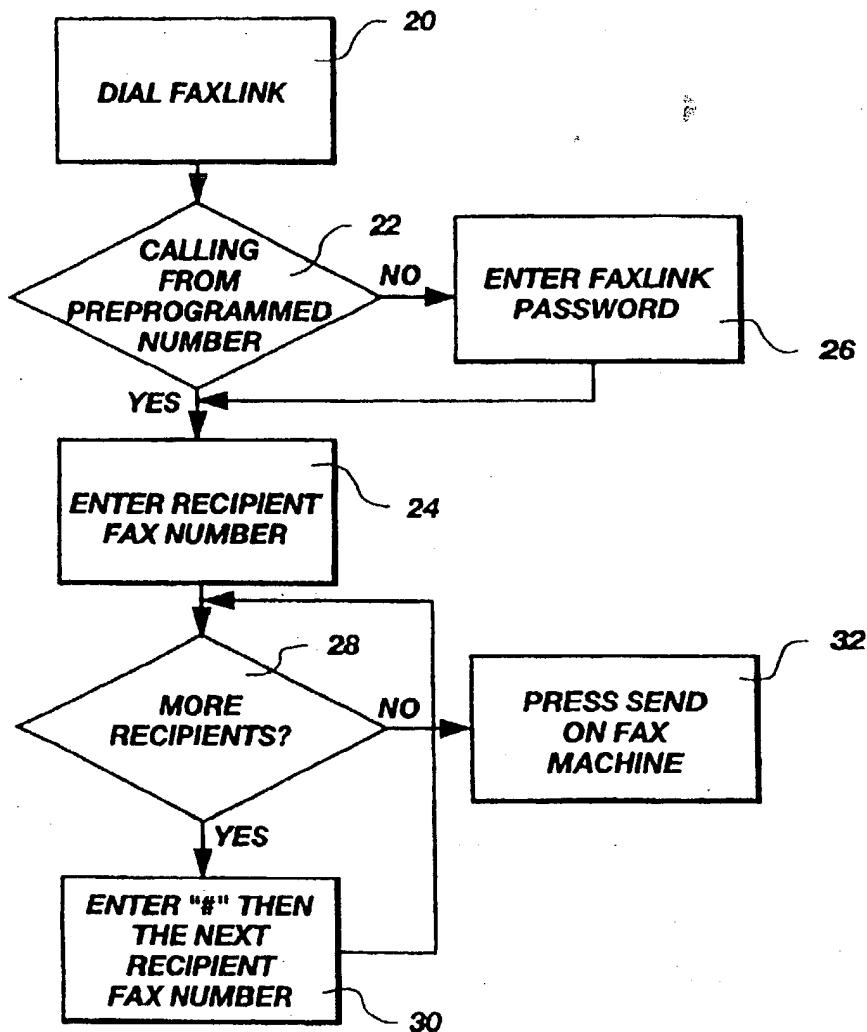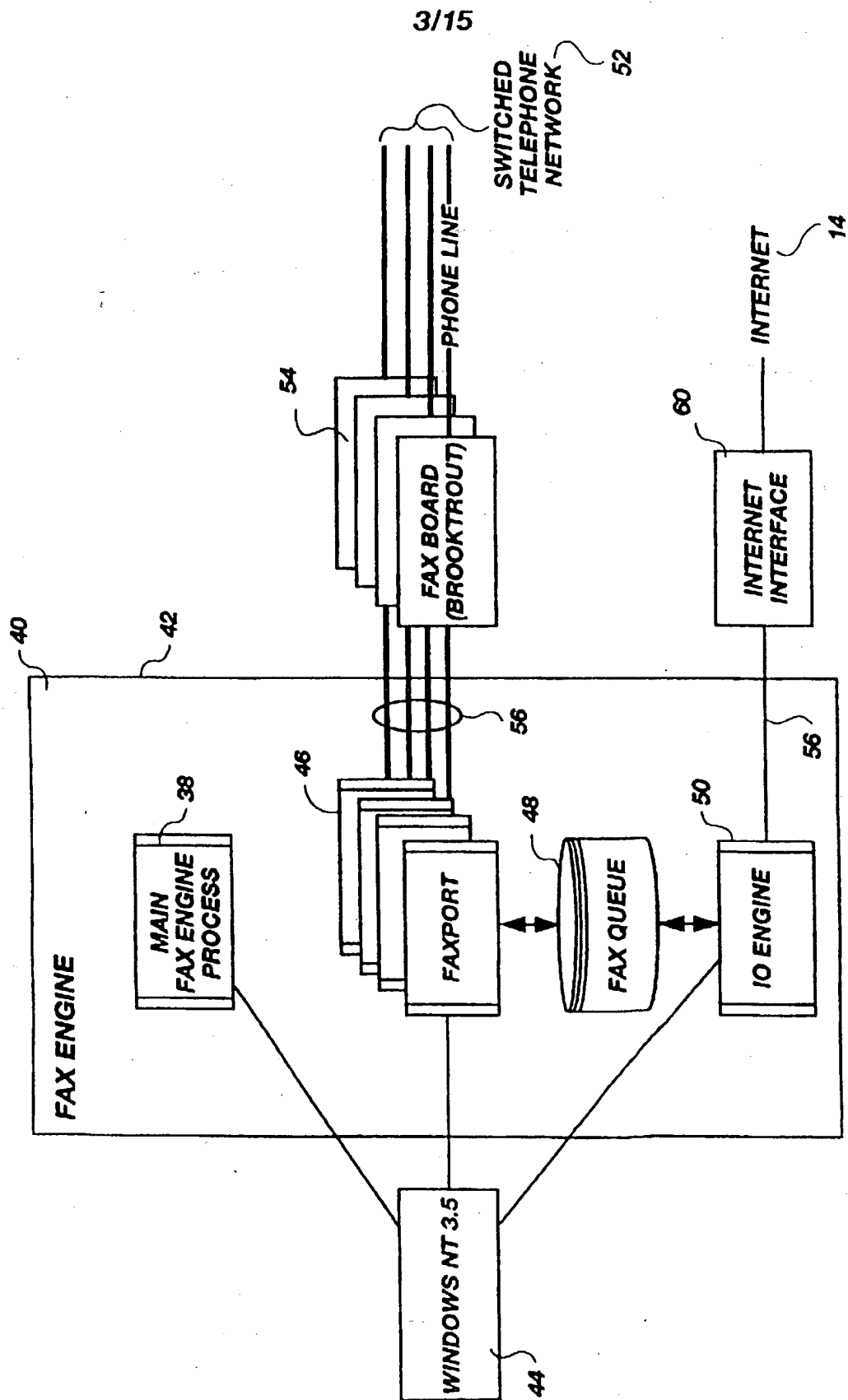
1/15

Fig. 1

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USER FLOWCHART

Fig. 2

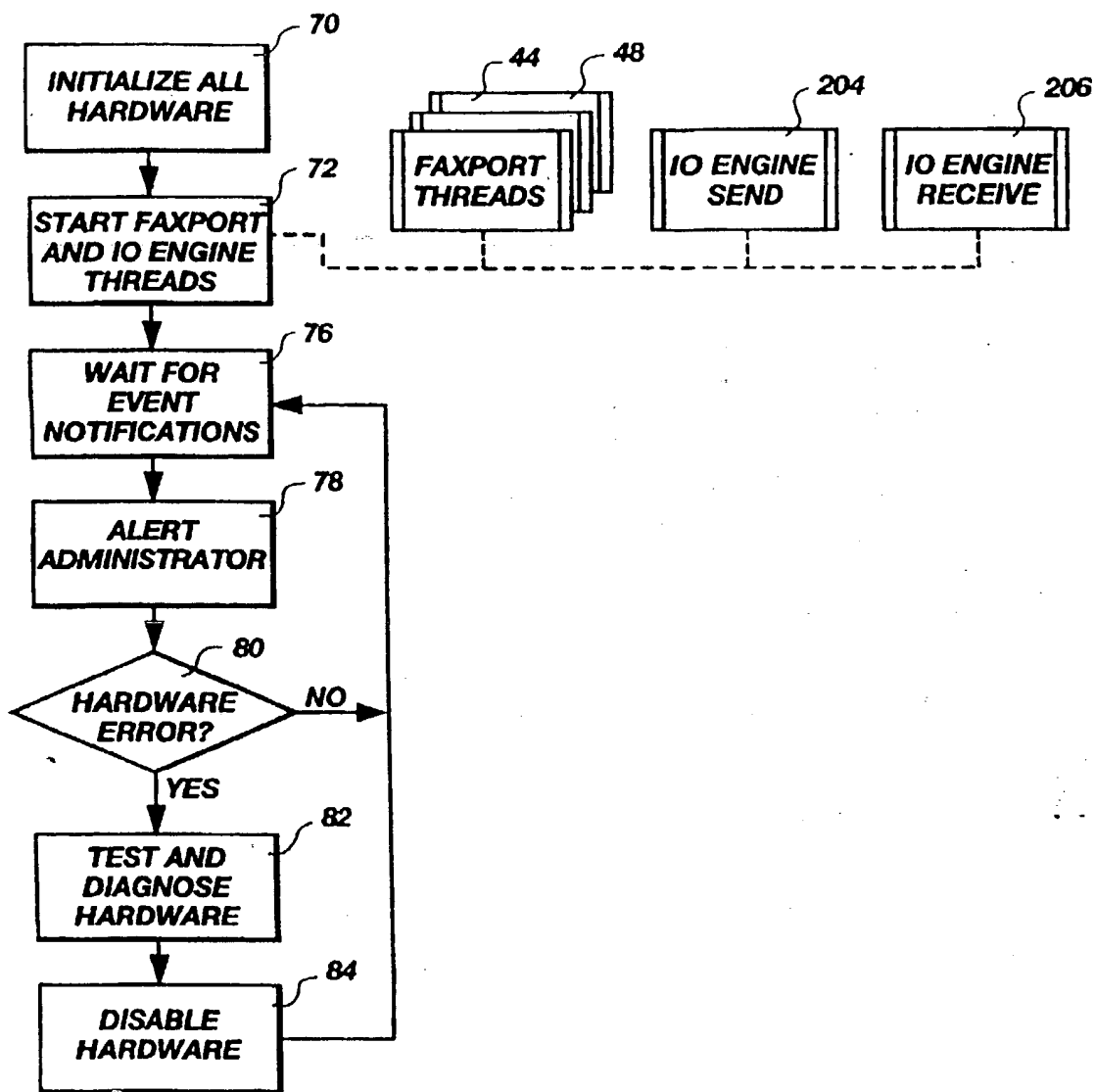Fig. 3

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MAIN FAXENGINE PROCESS

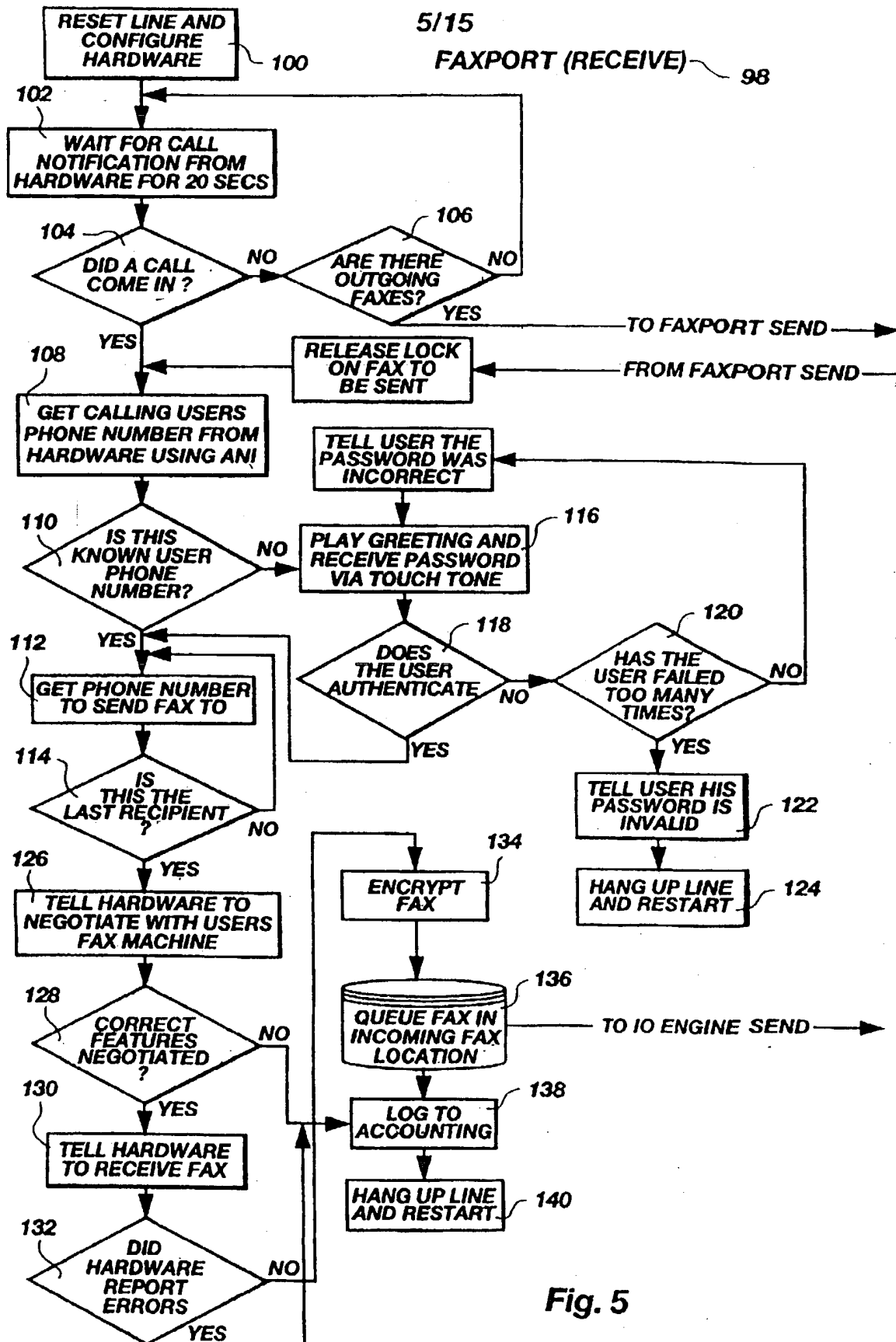Fig. 4

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FAXPORT (RECEIVE) ~ 98

RESET LINE AND CONFIGURE HARDWARE — 100

102

WAIT FOR CALL NOTIFICATION FROM HARDWARE FOR 20 SECS

104 — DID A CALL COME IN ?

106 — ARE THERE OUTGOING FAXES?

NO → TO FAXPORT SEND →

YES

RELEASE LOCK ON FAX TO BE SENT ← FROM FAXPORT SEND

108

GET CALLING USERS PHONE NUMBER FROM HARDWARE USING ANI

TELL USER THE PASSWORD WAS INCORRECT

110 — IS THIS KNOWN USER PHONE NUMBER?

NO → PLAY GREETING AND RECEIVE PASSWORD VIA TOUCH TONE — 116

YES

112 — GET PHONE NUMBER TO SEND FAX TO

118 — DOES THE USER AUTHENTICATE

120 — HAS THE USER FAILED TOO MANY TIMES?

NO

YES

114 — IS THIS THE LAST RECIPIENT ?

NO

YES → TELL USER HIS PASSWORD IS INVALID — 122

126 — TELL HARDWARE TO NEGOTIATE WITH USERS FAX MACHINE

134 — ENCRYPT FAX

HANG UP LINE AND RESTART — 124

128 — CORRECT FEATURES NEGOTIATED ?

NO

136 — QUEUE FAX IN INCOMING FAX LOCATION → TO IO ENGINE SEND →

130 — TELL HARDWARE TO RECEIVE FAX

YES

138 — LOG TO ACCOUNTING

HANG UP LINE AND RESTART — 140

132 — DID HARDWARE REPORT ERRORS

NO

YES

Fig. 5

FAXPORT (SEND) — 99

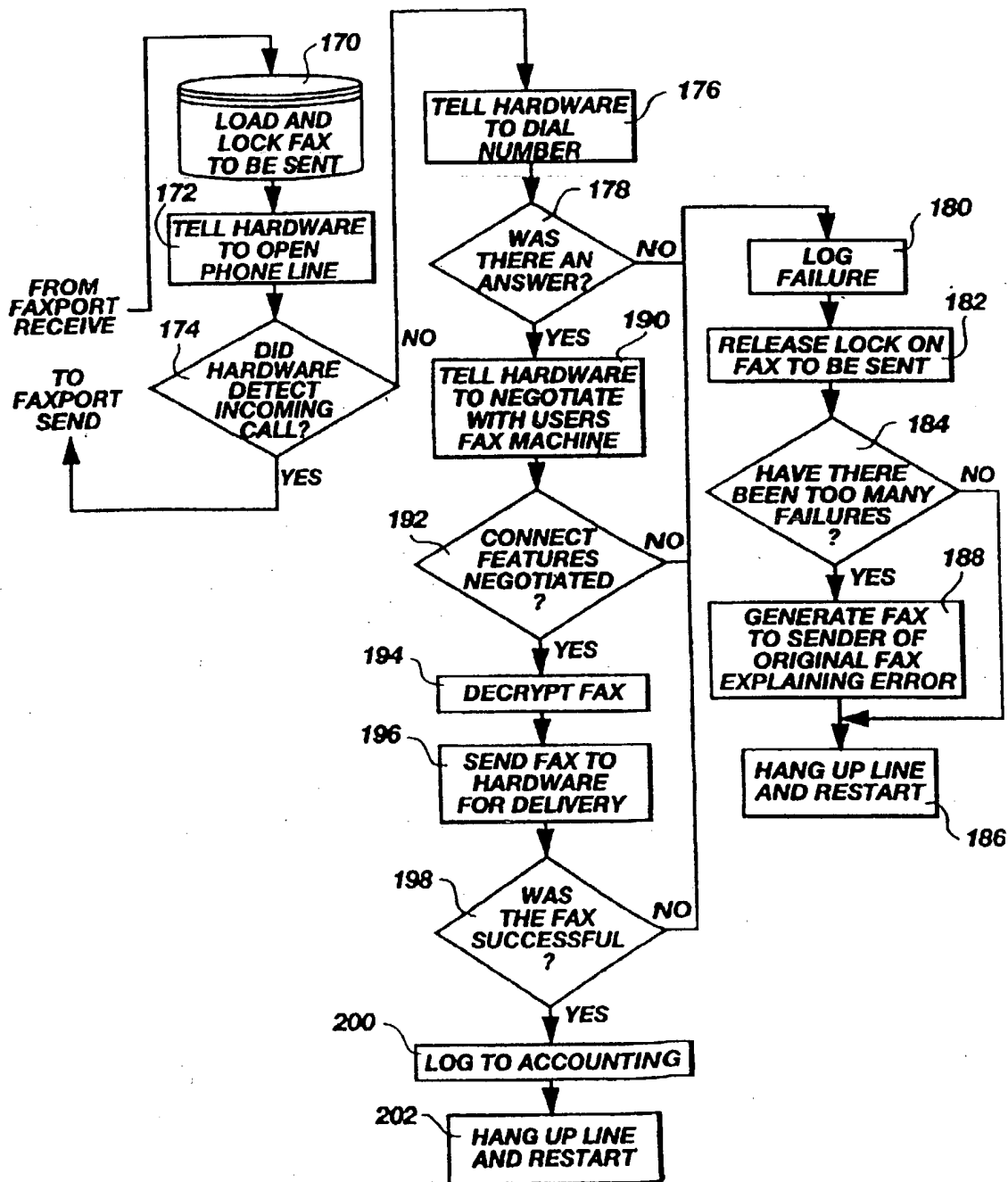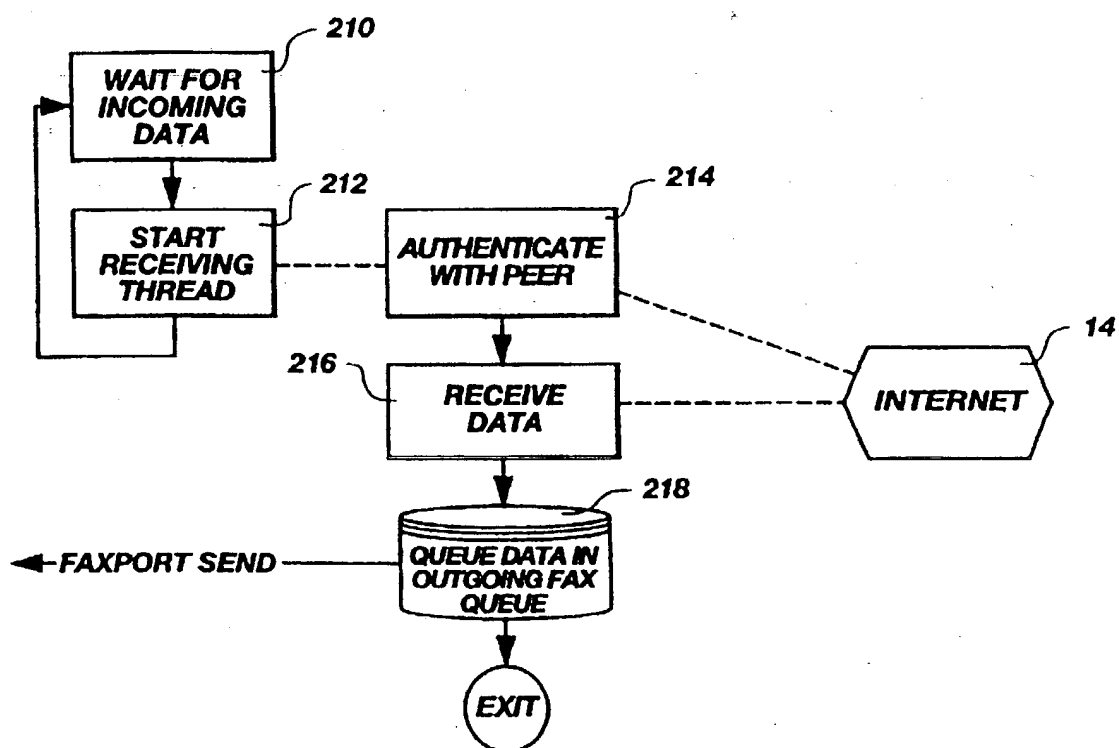**Fig. 6**

IO ENGINE (RECEIVE) — *206*

Fig. 7

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IO ENGINE (SEND) 200

Fig. 8

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ORIGINATING
FAX MACHINE
— 10

ORIGINATING
FAX MACHINE
— 12

INTERNET
— 14

RECEIVING
FAXENGINE
16 —

RECEIVING
FAXENGINE
— 16

RECEIVING
FAX MACHINE
— 18

(PRE-SELECTED
SITES)

Fig. 9

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Fig. 10

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ORIGINATING FAX MACHINE — 10

ORIGINATING FAX ENGINE — 12

INTERNET — 14

REDIRECTED RECEIVING EMAIL ADDRESS — 266

REDIRECTED RECEIVING FAX ENGINE — 262

RECEIVING FAX ENGINE — 16

REDIRECTED RECEIVING FAX MACHINE — 264

RECEIVING FAX MACHINE — 18
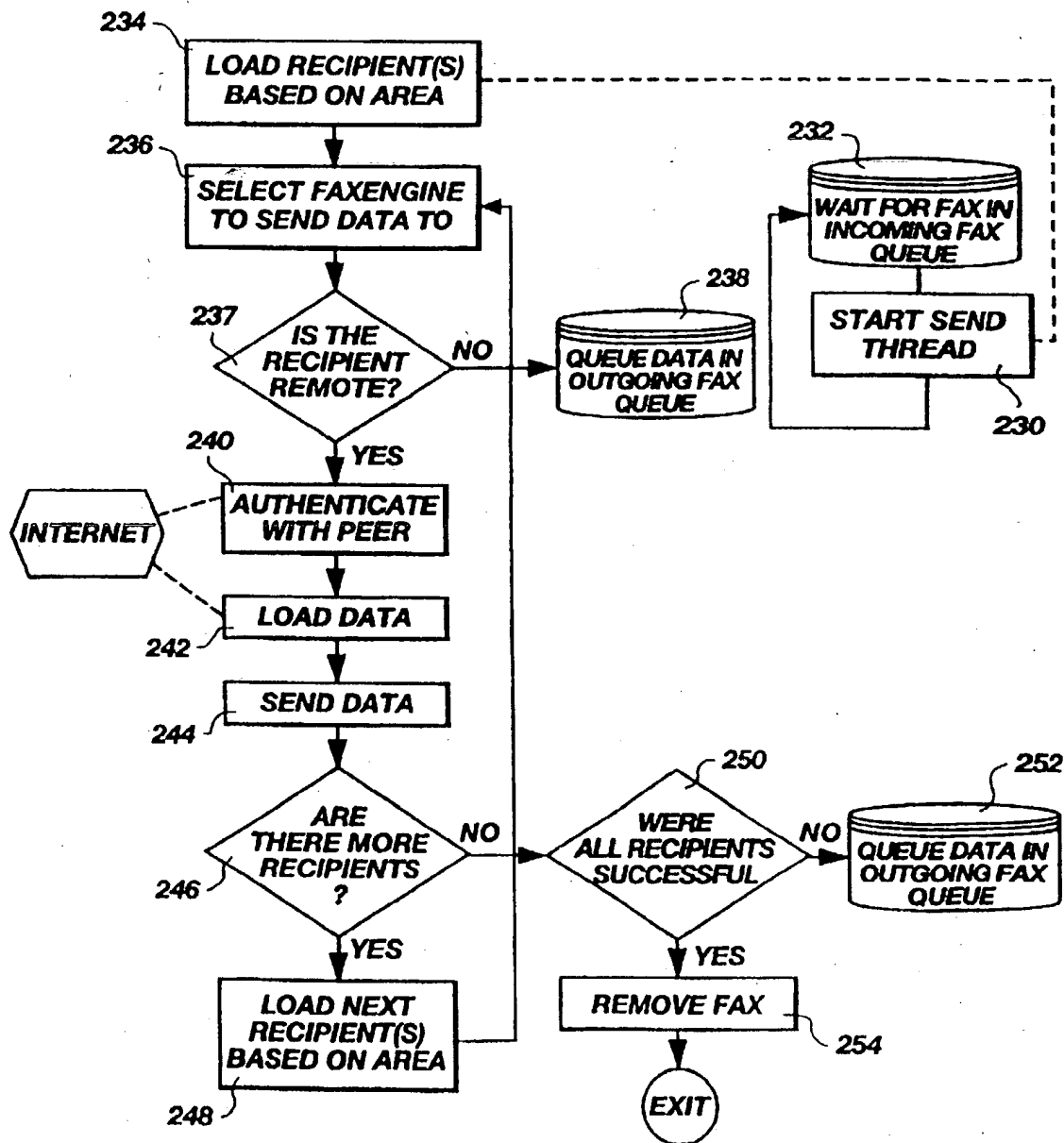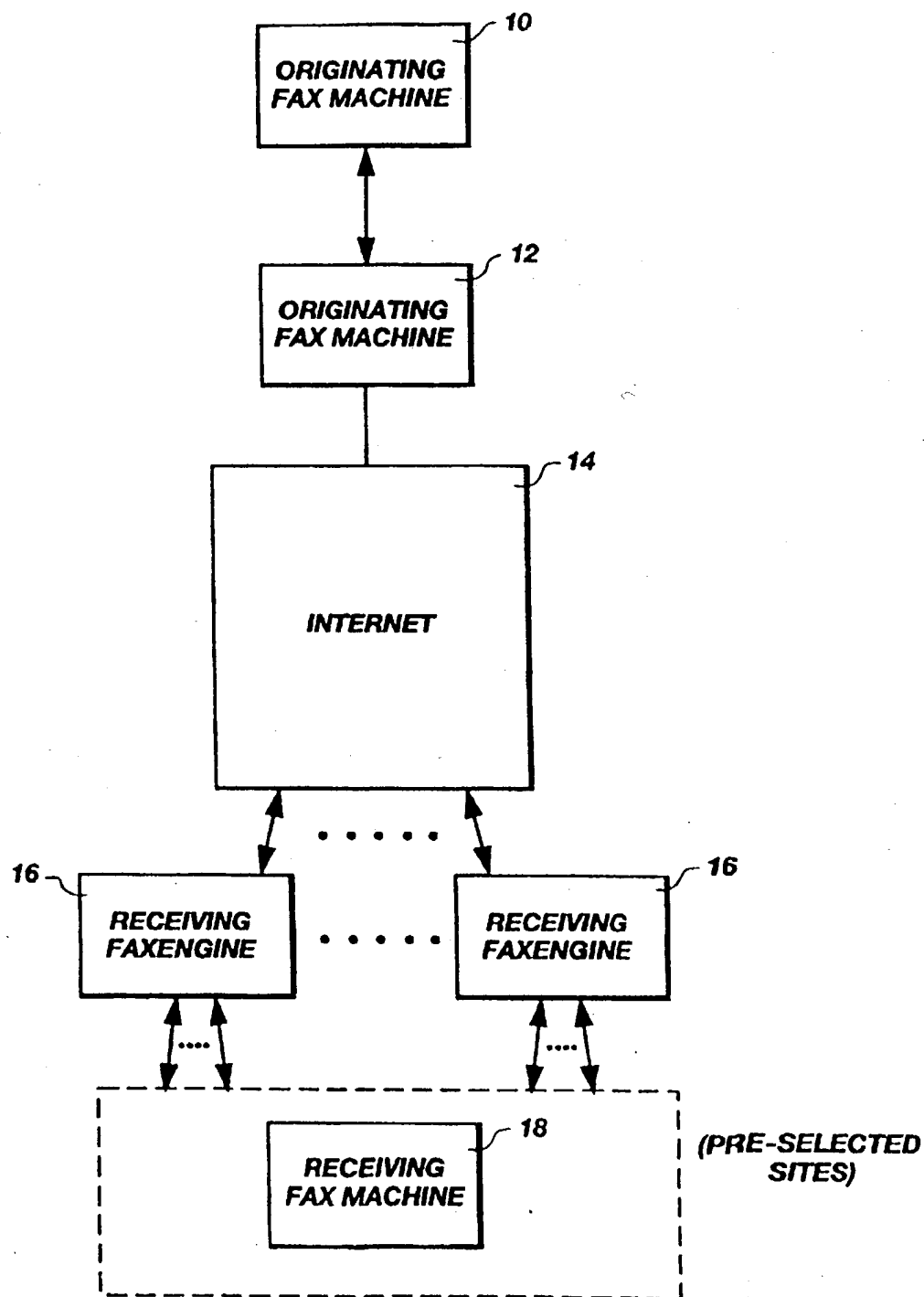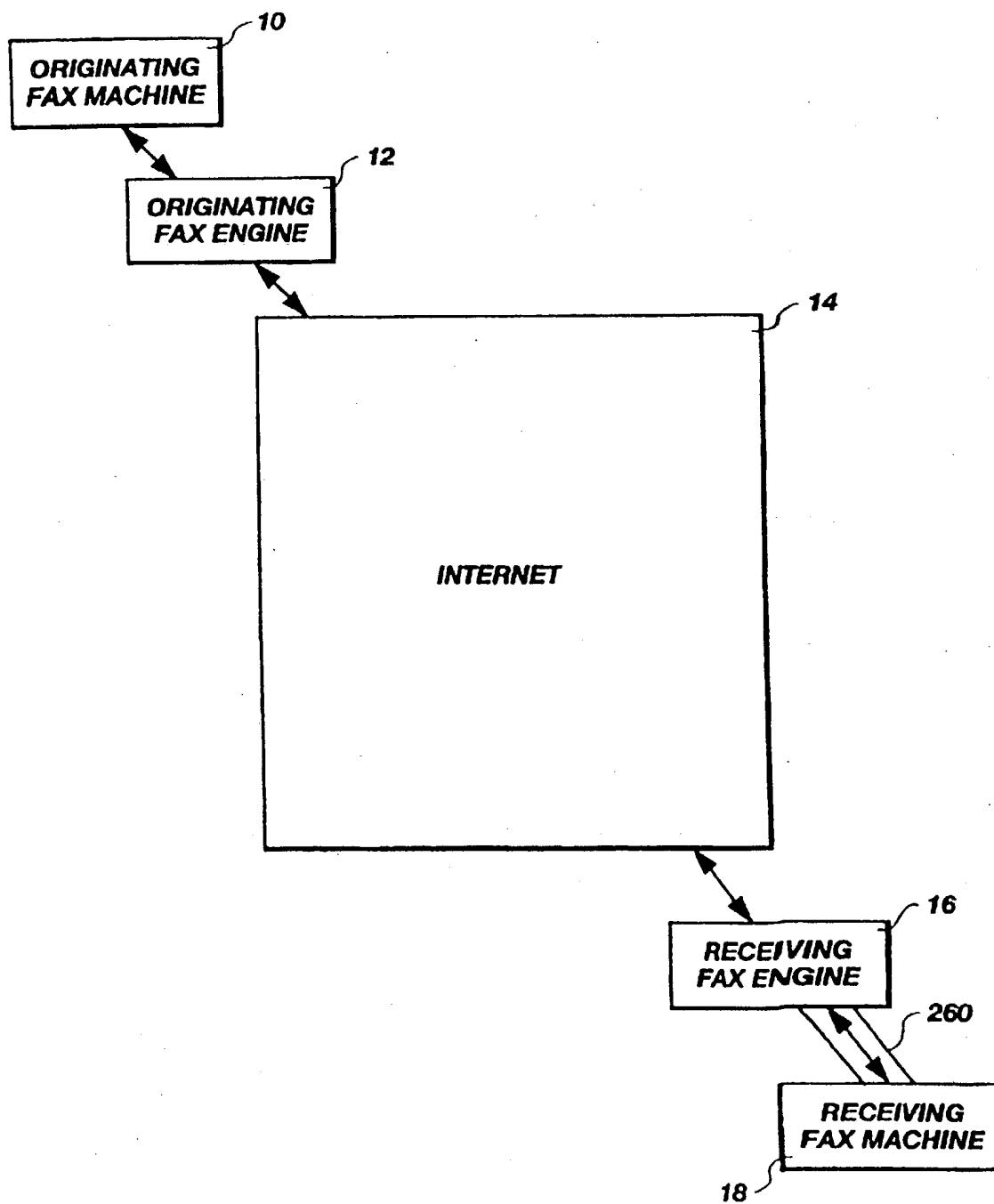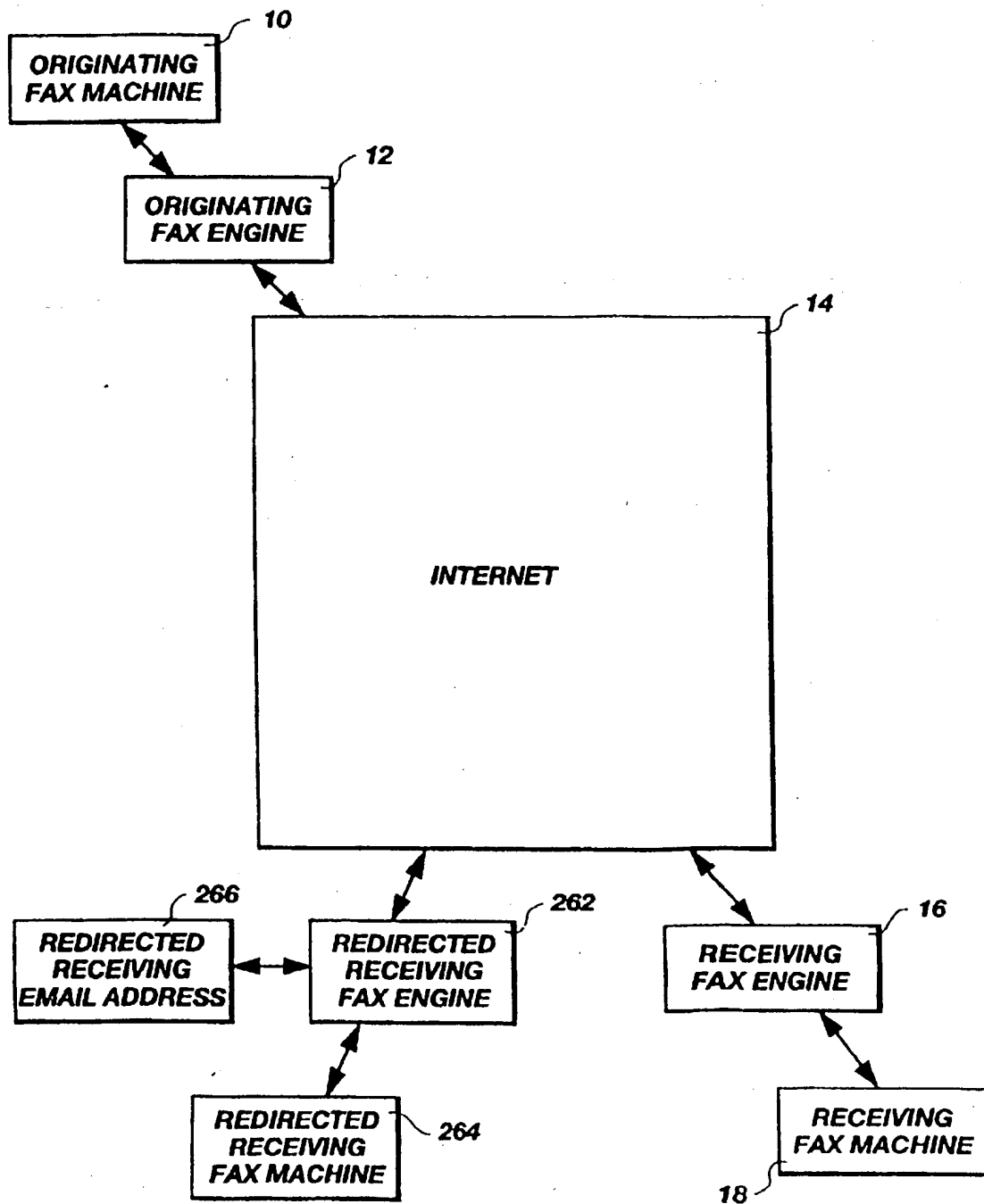
Fig. 11

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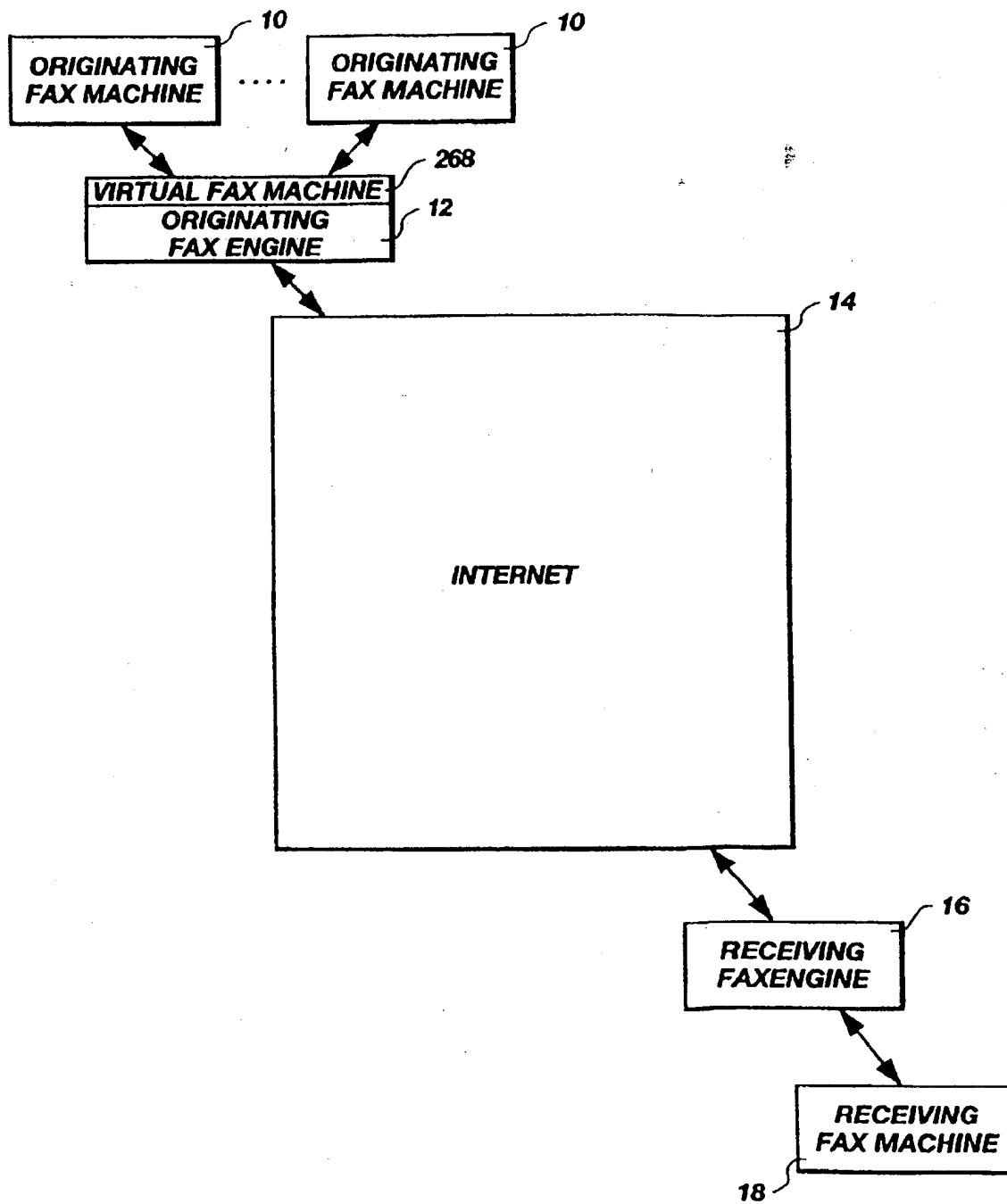
Fig. 12
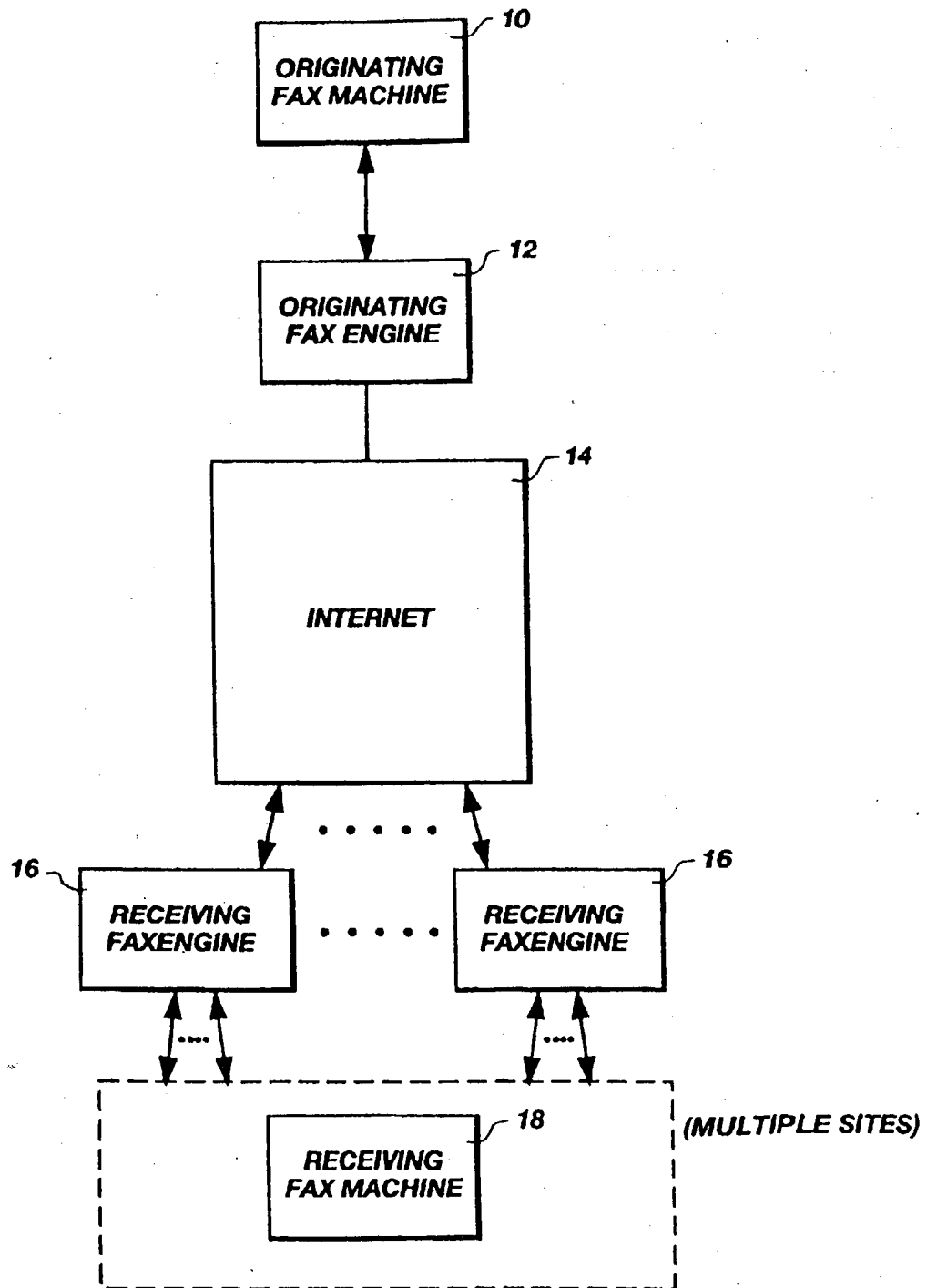
Fig. 13
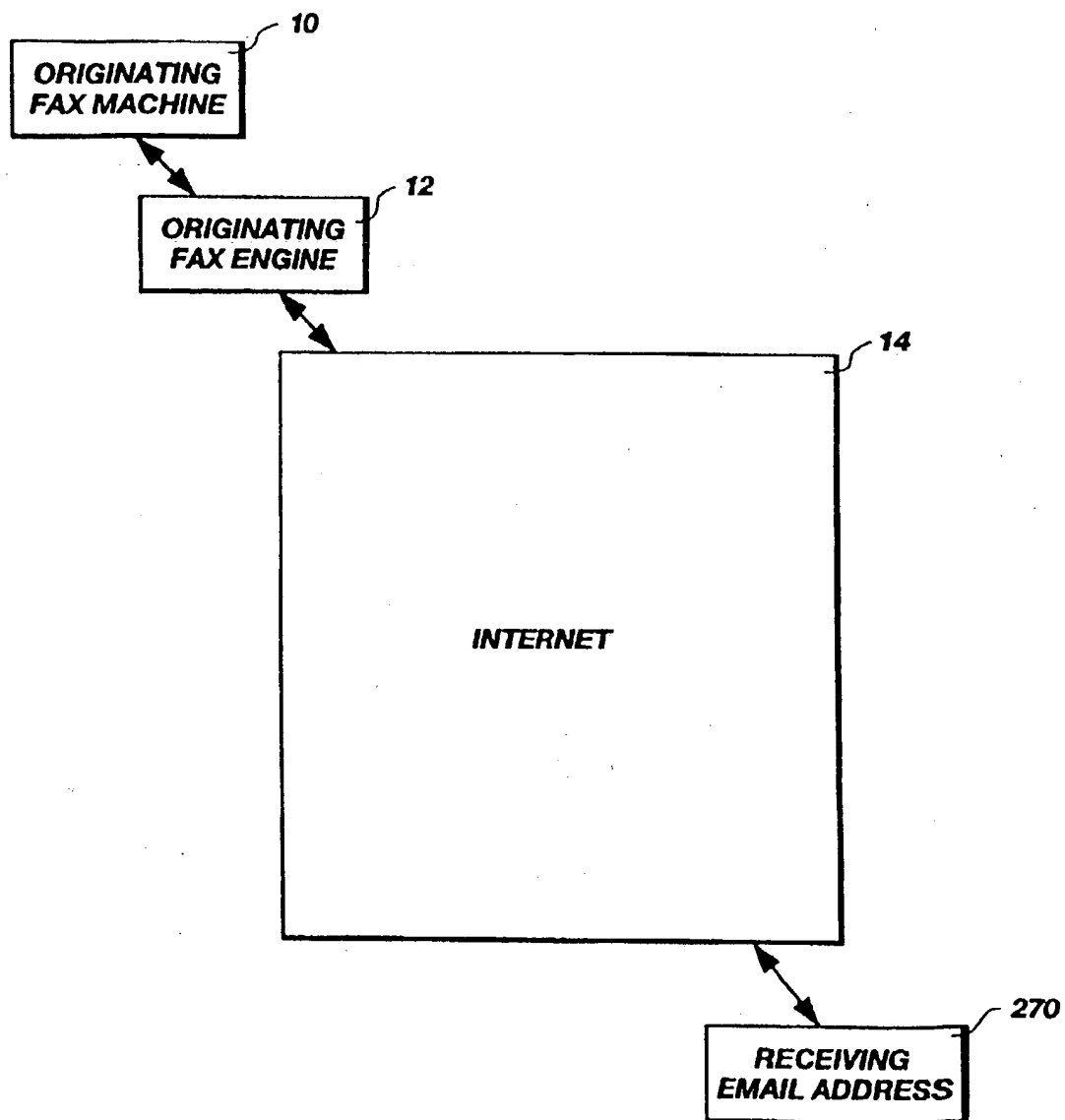
Fig. 14

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Fig. 15

INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :H04N 1/00, 1/32, 1/40; H04M 11/00; G06K 15/00

US CL : 358/400, 402, 442, 443; 379/100, 90; 364/514A

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 358/400, 402, 442, 443, 447, 468, 379/100, .90; 364/514A

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

APS

Search terms: Internet, facsimiles, Internet protocols, transmit or transmission, receive or reception, TCP/IP

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y, P	US 5,410,754 A (KLOTZBACH ET AL) 25 April 1995, col. 1, lines 24-68, col. 4, lines 44-68; col. 7, line 29 - col. 8, line 54; col. 9, line 50 - col 10, line 60.,	1-42
Y, P	US 5,513,126 A (HARKINS ET AL.) 30 April 1996, col 2, lines 14-41; col. 5, line 46 - col 6, line 2	37, 39, 40
A, P	US 5,572,581 A (SATTAR ET AL.) 05 November 1996, col. 6, line 49 - col 7, line 17; col. 8, line 27 - col 11, line 35.	1-42

☐ Further documents are listed in the continuation of Box C.   ☐ See patent family annex.

*	Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A"	document defining the general state of the art which is not considered to be of particular relevance		
"E"	earlier document published on or after the international filing date	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"O"	document referring to an oral disclosure, use, exhibition or other means		
"P"	document published prior to the international filing date but later than the priority date claimed	"&"	document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
27 MARCH 1997	**1 4 APR 1997**

Name and mailing address of the ISA/US	Authorized officer
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